

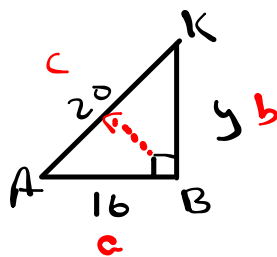
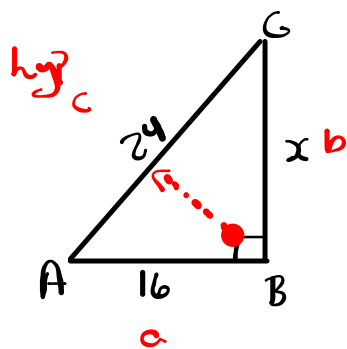
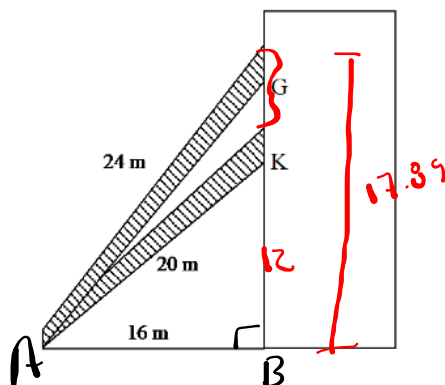
MID-YEAR EXAM REVIEW

Pythagorean Theorem

1. Two ladders, 24 m and 20 m long, are leaning against a building where a girl (G) and a kitten (K) are located.

The foot of each ladder is 16 m from the building.

How far is the girl from the kitten?



$$\begin{aligned} \textcircled{1} \overline{GB}: a^2 + b^2 &= c^2 \\ 16^2 + b^2 &= 24^2 \\ 256 + b^2 &= 576 \\ -256 &\quad -256 \\ \hline \sqrt{b^2} &= \sqrt{320} \\ b &= 17.89 \end{aligned}$$

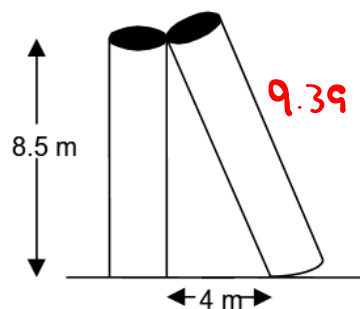
$$\begin{aligned} \textcircled{2} \overline{KB}: a^2 + b^2 &= c^2 \\ 16^2 + b^2 &= 20^2 \\ 256 + b^2 &= 400 \\ -256 &\quad -256 \\ \hline \sqrt{b^2} &= \sqrt{144} \\ b &= 12 \end{aligned}$$

$$\textcircled{3} \overline{GK} = 17.89 - 12 = 5.89 \text{ m}$$

MID-YEAR EXAM REVIEW

2. A pole that broke during the ice storm has toppled behind Lisa's house. To find the original height of the pole, Lisa measures the height of the pole that remains upright and the distance between the base of the pole and the top of it, as shown on the right.

Find the original height of the pole.

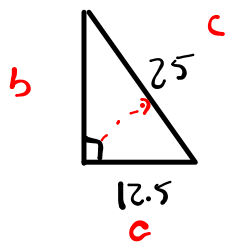


$$h = 8.5 + 9.39 = 17.89 \text{ m}$$

MID-YEAR EXAM REVIEW

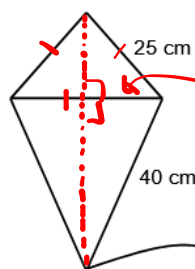
3. A kite is made up of 2 triangles. One is an equilateral triangle whose side measures 25 cm. The other is an isosceles triangle whose congruent sides measure 40 cm.

What is the total area of the kite?



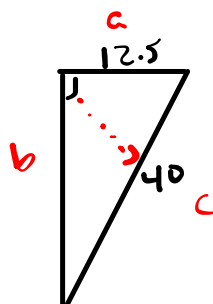
$$b = 21.65$$

$$A = \frac{21.65(25)}{2} = 272.63$$



$$A = \frac{bh}{2}$$

$$\frac{25}{2} = 12.5$$



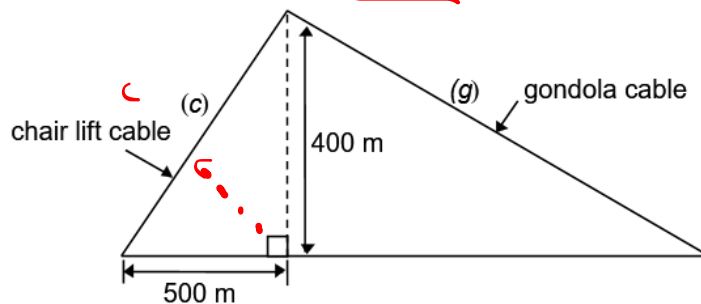
$$b = 38$$

$$A = \frac{38(25)}{2} = 475$$

$$A_T = 745.63 \text{ cm}^2$$

MID-YEAR EXAM REVIEW

4. Both a chair lift and a gondola are used to transport skiers to the top of a ski hill. The length of the gondola cable is twice the length of the chair lift cable.



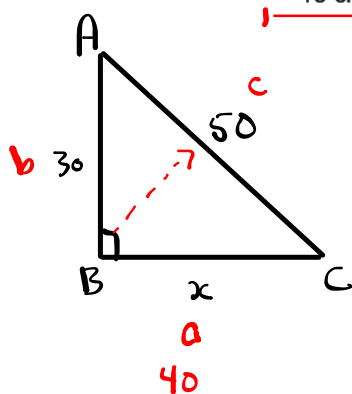
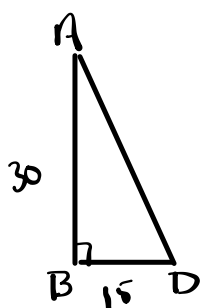
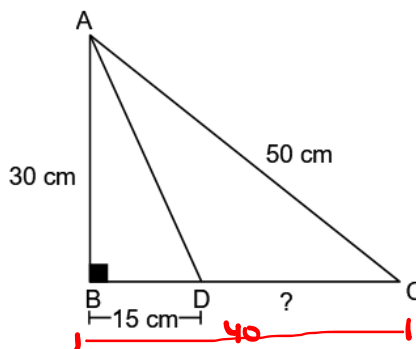
If the gondola travels at 5 m per second, how long will the gondola ride take?

① Chair: $c = 640\text{m}$ ② Gond = $2(640)$
 $= 1280\text{m}$

③ $\frac{1280}{5} = 256\text{ sec}$

MID-YEAR EXAM REVIEW

5. What is the length of \overline{DC} ?



① \overline{BC} : $a = 40$

② \overline{DC} : $40 - 15 = 25 \text{ cm}$

MID-YEAR EXAM REVIEW

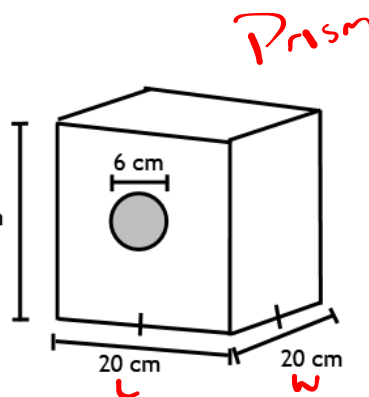
Area/Volume

6. Karen is painting the outside of her birdhouse. She needs to calculate how much paint is needed. The birdhouse has a square base.

- The shaded hole has a diameter of 6 cm. h 30 cm

$$r = \frac{6}{2} = 3 \text{ cm}$$

What is the total surface area of her birdhouse?



$$\begin{aligned} \textcircled{1} \quad A_T &= 2A_b + A_L \\ &= 2(20)^2 + 2400 \\ &= 800 + 2400 \\ &= 3200 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad A_L &= P_b \cdot h \\ 4(20)(30) &= 2400 \text{ cm}^2 \end{aligned}$$

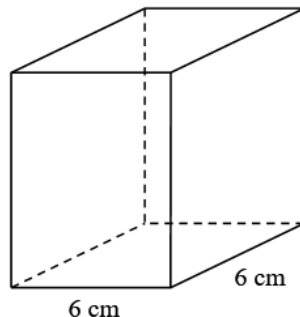
$$\begin{aligned} \textcircled{3} \quad A_{\text{cr}} &= \pi r^2 \\ &= 28.26 \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad A_T &= 3200 - 28.26 \\ &= 3171.74 \text{ cm}^2 \end{aligned}$$

MID-YEAR EXAM REVIEW

7. The total area of a square prism whose base measures 6 cm a side is 312 cm^2 .

What is the height of the prism?



$$A_T = 312 \text{ cm}^2$$

$$A_T = 2A_b + A_L$$

$$312 = 2(6)^2 + 4(6)h$$

$$312 = \cancel{72} + 24h$$

$$\begin{array}{r} 312 \\ -72 \\ \hline \end{array}$$

$$\frac{240}{24} = \frac{24h}{24}$$

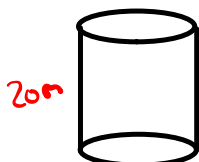
$$10 = h$$

$$\Rightarrow \boxed{\text{height} = 10 \text{ cm}}$$

$$A_L = Ph$$

MID-YEAR EXAM REVIEW

8. A tank is in the shape of a right cylinder whose height is 20 m. The tank can hold 6280 kL of oil. What is the length of the diameter of this tank?



$$\textcircled{1} V = 6280 \text{ kL} = 6280 \text{ m}^3$$

$$\textcircled{2} V_{\text{cyl}} = A_b h$$
$$\frac{6280}{20} = \frac{\pi r^2 (20)}{20}$$

$$\frac{314}{\pi} = \frac{\pi r^2}{\pi}$$

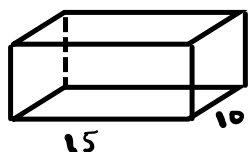
$$\sqrt{100} = \sqrt{r^2}$$

$$10 = r$$

$$\textcircled{3} d = 2(10)$$
$$\boxed{d = 20 \text{ m}}$$

MID-YEAR EXAM REVIEW

9. Julie bought a 2.4-litre box of laundry detergent. The box is in the shape of a rectangular prism in which the base measures 15 cm by 10 cm. When she got home, she emptied the contents of the box into cylindrical containers, 10 cm in diameter. The containers are half the height of the box. **How many containers will she need to use?**



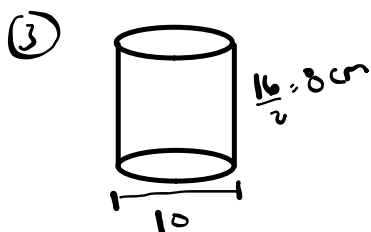
$$\textcircled{1} \quad 2.4 \text{ L} = 2400 \text{ ml} = 2400 \text{ cm}^3$$

$$\textcircled{2} \quad V_{\text{prism}} = A_b h$$

$$2400 = 15(10)h$$

$$\frac{2400}{150} = \frac{150h}{150}$$

$$16 = h$$



$$\begin{aligned} V_{\text{cyl}} &= A_b h \\ &= \pi r^2 h \\ &= \pi (5^2)(8) \\ &= 628 \text{ cm}^3 \end{aligned}$$

$$\textcircled{4} \quad \frac{2400}{628} = 3.82 \Rightarrow 4$$

4 containers

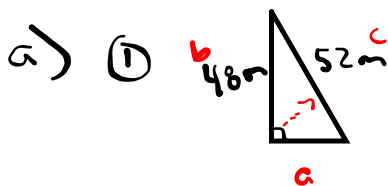
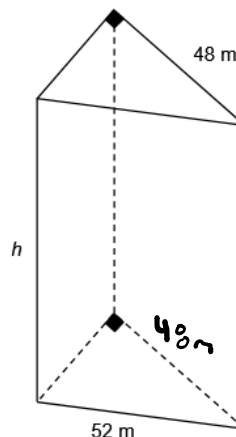
MID-YEAR EXAM REVIEW

10. An engineer is trying to determine the heating and air conditioning needs of a building in the shape of a right triangular prism.

The building has a volume of $32\,640\text{ m}^3$.
It is 17 storeys high.

a) What is the distance, in metres, between each storey?

b) What is the lateral area of this building?



$$\begin{aligned} a^2 + b^2 &= c^2 \\ a^2 + 48^2 &= 52^2 \\ a^2 + 2304 &= 2704 \\ -2304 &\quad -2304 \\ \hline a^2 &= 400 \\ a &= 20 \end{aligned}$$

② $V = A_b h$

$$32640 = \frac{48(20)}{2} h$$

$$\frac{32640}{480} = \frac{480h}{480}$$

$$68 = h$$

③ Distance = $\frac{68}{17} = 4\text{ m}$

b) $A_T = 2A_b + A_L$

$$= 2\left(\frac{48(20)}{2}\right) + (48 + 52 + 20)(68)$$

$$= 960 + 8160 = 9120\text{ m}^2$$

MID-YEAR EXAM REVIEW

Inequalities

11. Solve the following inequalities. Express the solution set using interval notation.

a) $2x + 9 \leq 3x - 5$

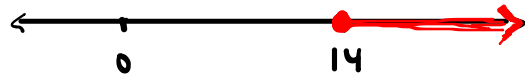
$[14, +\infty[$

$$\begin{array}{rcl} 2x + 9 & \leq & 3x - 5 \\ -3x & & -3x \end{array}$$

$$\begin{array}{rcl} -1x + 9 & \leq & -5 \\ -9 & & -9 \end{array}$$

$$\begin{array}{rcl} -1x & \leq & -14 \\ \hline -1 & & -1 \end{array}$$

$$x \geq 14$$



MID-YEAR EXAM REVIEW

$$\text{b) } -3(x-5) > 4x+1$$

$$]-\infty, 2[$$

$\times \div$

$$\begin{array}{r} -3x+15 > 4x+1 \\ -4x-15 \quad -4x-15 \end{array}$$

$\begin{array}{c} ++ \\ -- \end{array} \} +$

$\begin{array}{c} -+ \\ +- \end{array} \} -$

$$\begin{array}{r} -7x > -14 \\ \hline -7 \quad \quad \quad -7 \end{array}$$

$$x < 2$$



$$]-\infty, 2[$$

MID-YEAR EXAM REVIEW

c) $-2(x+7) > 5(2-2x)$

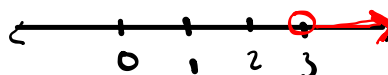
$]3, +\infty[$

$$\begin{array}{rcl} -2x - 14 & > & 10 - 10x \\ +10x & & +10x \end{array}$$

$$\begin{array}{rcl} 8x - 14 & > & 10 \\ +14 & & +14 \end{array}$$

$$\begin{array}{rcl} 8x & > & 24 \\ \hline 8 & & 8 \end{array}$$

$$x > 3$$



MID-YEAR EXAM REVIEW

d) $3x + 1 \geq -4x + 22$

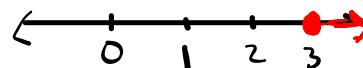
$$\underline{[3, +\infty[}$$

$$\begin{array}{rcl} 3x + 1 & \geq & -4x + 22 \\ +4x & & +4x \end{array}$$

$$\begin{array}{rcl} 7x + 1 & \geq & 22 \\ -1 & & -1 \end{array}$$

$$\begin{array}{rcl} 7x & \geq & 21 \\ \hline 7 & & 7 \end{array}$$

$$x \geq 3$$



MID-YEAR EXAM REVIEW

12. Michael is a car salesman. His annual salary is \$25,000. He receives an additional \$2,500 commission for each car he sells. **Determine the minimum number of cars Michael must sell in a year in order for his salary to exceed \$55,000.**

$$2500x + 25000 > 55000$$
$$\begin{array}{r} 2500x + 25000 > 55000 \\ -25000 \quad -25000 \\ \hline \end{array}$$

$$\begin{array}{r} 2500x > 30000 \\ \hline 2500 \quad 2500 \\ \hline x > 12 \end{array}$$

Michael must
sell more than
12 cars

MID-YEAR EXAM REVIEW

13. The company Chatz is offering \$20 a month plus \$0.10 per minute. The company TalkPlus is offering \$0.25 per minute with no monthly fee. **After how many minutes is it more expensive to use TalkPlus than to use a Chatz cell phone?**

x : # minutes

Chatz: $0.10x + 20$

TalkPlus: $0.25x$

$$\begin{array}{rcl} 0.25x & > & 0.10x + 20 \\ -0.10x & & -0.10x \end{array}$$

$$\begin{array}{rcl} 0.15x & > & 20 \\ \hline 0.15 & & 0.15 \end{array}$$

$$x > 133.33$$

Talkplus is more expensive after 134 min.

MID-YEAR EXAM REVIEW

14. EcoAuto charges a flat fee of \$32 plus \$0.15 for every kilometre. TwentyTwenty charges a flat fee of \$20 plus \$0.20 for every kilometre. **What is the minimum number of kilometres that you must travel in order for it to be advantageous to rent a car from EcoAuto?**

x : # km

$$\text{Eco Auto} : 0.15x + 32$$

$$\text{Twenty} : 0.20x + 20$$

$$\boxed{240 \text{ km}}$$

$$0.15x + 32 \leq 0.20x + 20$$

$$-0.05x$$

$$-0.20x$$

$$-0.05x + 32 \leq 20$$

$$-32$$

$$-32$$

$$\frac{-0.05x}{-0.05} \leq \frac{-12}{-0.05}$$

$$x \geq 240$$

MID-YEAR EXAM REVIEW

15. During a drought, a 2000-L concrete holding tank loses 48L of water per day as a result of evaporation. The tank cannot contain less than 1200L of water, otherwise it might crack. **What is the maximum number of days that the drought can last without damaging the tank?**

x : # days

$$\begin{array}{rcl} 2000 - 48x & \geq & 1200 \\ - 2000 & & - 2000 \end{array}$$

$$\begin{array}{rcl} -48x & \geq & -800 \\ \hline -48 & & -48 \end{array}$$

$$x \leq 16.67$$

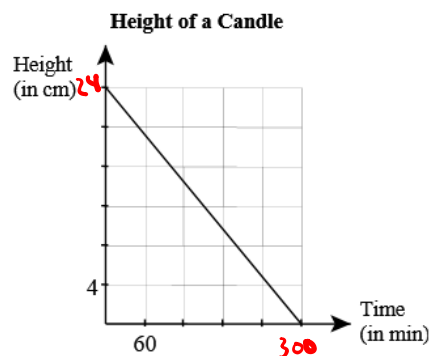
16 days

MID-YEAR EXAM REVIEW

Linear Functions

16. The height of a candle varies according to the time that it burns. **What is the rate of change associated with this relation?**

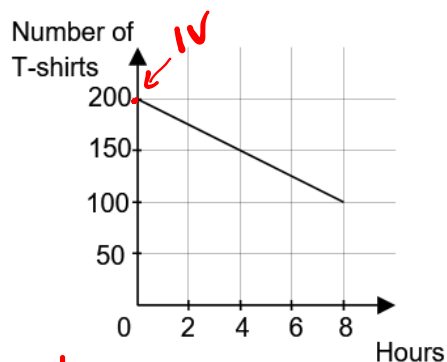
$$\begin{matrix} x_1 & y_1 \\ (0, & 24) \end{matrix} \quad \begin{matrix} x_2 & y_2 \\ (300, & 0) \end{matrix}$$



$$R.O.C = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 24}{300 - 0} = \frac{-24}{300} = -\frac{2}{25} \text{ or } -0.08$$

MID-YEAR EXAM REVIEW

17. The flea market had been open for 8 hours. Write an equation which expresses the number y of T-shirts left after x hours.



① $(x_1, y_1) = (0, 200)$ $(x_2, y_2) = (8, 100)$

② $a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{100 - 200}{8 - 0} = \frac{-100}{8} = -12.5$

$b = 200$

③ $y = -12.5x + 200$

MID-YEAR EXAM REVIEW

18. A swimming pool already has 5000 litres of water in it. It is being refilled at the rate of 750 litres an hour. **Complete the table of values:**

R.O.C.

x	Time (hours)	0	<u>1</u>	<u>3</u>	12	<u>15</u>	x
y	Quantity of water (litres)	<u>5000</u>	5750	7250	<u>14000</u>	16 250	$y = 750x + 5000$

$$y = 750x + 5000$$

$$\textcircled{2} \quad \begin{array}{r} 5750 = 750x + 5000 \\ -5000 \quad \quad -5000 \end{array}$$

$$\begin{array}{r} 750 = 750x \\ \hline 750 \quad 750 \\ 1 = x \end{array}$$

$$\textcircled{3} \quad \begin{array}{r} 7250 = 750x + 5000 \\ -5000 \quad \quad -5000 \end{array}$$

$$\begin{array}{r} 2250 = 750x \\ \hline 750 \quad 750 \\ 3 = x \end{array}$$

$$\textcircled{4} \quad y = 750(12) + 5000$$

MID-YEAR EXAM REVIEW

19. A cross-country ski club offers skiers two payment options.

Option 1: An annual membership fee of \$30 and a \$5 fee for each day skiing on the trail.

Option 2: No annual membership fee, but a set fee for each day skiing on the trail.

Andy, who chose the first payment option, paid \$105 for the season. Sonia chose the second option. She skied as many days as Andy did, and paid the same amount. **What is the set price per day with the second payment option?**

x : # days

Andy: (Opt 1): $y = 5x + 30$

$$105 = 5x + 30$$

$$\frac{75}{5} = \frac{5x}{5}$$

$$15 = x$$

Sonia: 15 days \$105

(Opt 2) $y = ax$

$$\frac{105}{15} = \frac{a(15)}{15}$$

$$\$7 = a$$

The set price for Opt 2
is \$7 per day

MID-YEAR EXAM REVIEW

20. A landscape gardener charges a fixed amount for travel plus an hourly rate for any work done.

Monday he worked 5 hours and earned \$90.50.

Tuesday he worked 8 hours and earned \$134.00.

If he works 6 hours on Wednesday, how much will he earn?

x : # hours

y : \$ earned

$$\textcircled{1} \quad \begin{matrix} x_1 & y_1 \\ (5, & 90.50) \end{matrix} \quad \begin{matrix} x_2 & y_2 \\ (8, & 134.00) \end{matrix}$$

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{134 - 90.50}{8 - 5} = \frac{43.50}{3} = 14.50$$

$$\begin{aligned} \textcircled{2} \quad y &= ax + b \\ 134 &= 14.50(8) + b \\ 134 &= 116 + b \\ -116 &\quad -116 \\ 18 &= b \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad y &= 14.50x + 18 \\ &= 14.50(6) + 18 \\ &= 87 + 18 \\ &= \$105 \end{aligned}$$

He will earn \$105.00

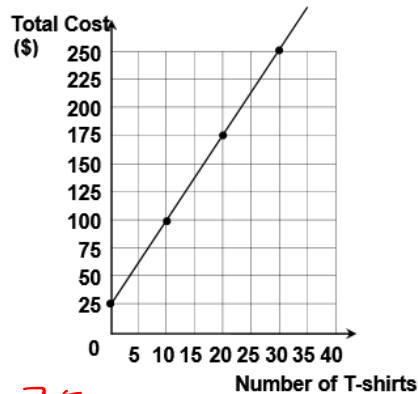
MID-YEAR EXAM REVIEW

21. The graph represents the cost of ordering T-shirts from a printing company. A delivery fee of \$25 is included in the cost.

How much does it cost to purchase 125

T-shirts from this company?

$$\begin{matrix} x_1 & y_1 & & x_2 & y_2 \\ (0, 25) & & & (10, 100) \end{matrix}$$



$$\textcircled{1} \quad a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{100 - 25}{10 - 0} = \frac{75}{10} = 7.50$$

$$\begin{aligned} \textcircled{2} \quad y &= 7.50x + 25 \\ &= 7.50(125) + 25 \\ &= 937.50 + 25 = \boxed{\$962.50} \end{aligned}$$

MID-YEAR EXAM REVIEW

22. The members of a certain tennis club have to buy an annual membership card. In addition, they must pay a fixed hourly rate to rent a tennis court.

Paul, Kelly, and Lana all belong to this club. Paul spent \$47 for his membership card and 20 hours of court time. Kelly paid \$106.80 for her membership card and 72 hours of court time.

How much will it cost Lana for her membership card and 45 hours of court time?

x : # hours

y : Cost

$$\begin{matrix} x_1 & y_1 & x_2 & y_2 \\ (20, 47) & (72, 106.80) \end{matrix}$$

$$\textcircled{1} \quad a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{106.80 - 47}{72 - 20} = \frac{59.80}{52} = 1.15$$

$$\begin{aligned} \textcircled{2} \quad y &= 1.15x + b \\ 47 &= 1.15(20) + b \\ 47 &= 23 + b \\ -23 & \quad -23 \\ 24 &= b \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad y &= 1.15x + 24 \\ &= 1.15(45) + 24 \\ &= 51.75 + 24 \\ &= \boxed{75.75} \end{aligned}$$

23. The weekly salaries of three workers are calculated as follows:

Josée's salary	A basic salary of \$80, plus \$18 per hour
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Jack's salary

Time (hours)	0	10	20	30	40
Salary (\$)	0	200	400	600	800

One week, Alan worked 40 hours. Josée and Jack earned the same amount of money as Alan did that week.

How many more hours did Josée work than Jack that particular week?

① Alan: $S = 22(40) + 100 = \$980$

(2) Josee: $S = 18h + 80$

$$980 = 18h + \cancel{80}$$

$$\frac{900}{18} = \frac{18h}{18}$$

$$50 = h$$

③ Jack: $a = \frac{200 - 0}{10 - 0} = \frac{200}{10} = 20$

$$S = 20h$$

$$\frac{900}{20} = \frac{20h}{20}$$

$$49 = h$$

(4) $50 - 49 = 1 \text{ hour}$

Joe worked 1 hr more than Jack.