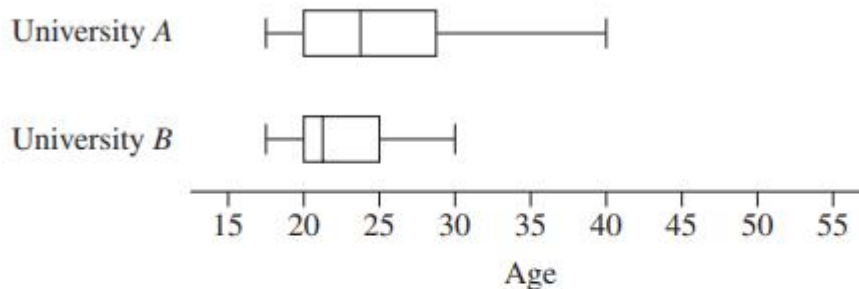


2020 HSC Common Questions with Mathematics Standard 2

Q2 Sorry this question is not common but it is a good question and I have answered it so it is staying.

- 2 A random sample of students was taken from each of two universities, and their ages were recorded. The boxplots of their ages are shown.



For the given samples of students' ages, which of the following statements is FALSE?

- A. The range for University A is smaller than the range for University B.
- B. The median for University A is higher than the median for University B.
- C. The interquartile range (IQR) for University A is larger than the IQR for University B.
- D. The oldest student in the sample from University A is older than the oldest student in the sample from University B.

A. Range of Uni A is Highest Score minus Lowest Score = $40 - 17 = 23$

Range of Uni B = $30 - 17 = 13$ **FALSE – Therefore correct answer.**

B. Median of Uni A is 24. Median of Uni B is 22

C. IQR of Uni A = $28 - 20 = 8$. IQR of Uni B = $25 - 20 = 5$.

D. Oldest student for Uni A = 40. Oldest student from Uni B = 30.

- 3 What is 0.002073 expressed in standard form with two significant figures?

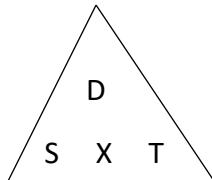
- A. 2.07×10^{-2}
- B. 2.1×10^{-2}
- C. 2.07×10^{-3}
- D. 2.1×10^{-3}

Answer: D

- 7 The distance between Bricktown and Koala Creek is 75 km. A person travels from Bricktown to Koala Creek at an average speed of 50 km/h.

How long does it take the person to complete the journey?

- A. 40 minutes
- B. 1 hour 25 minutes
- C. 1 hour 30 minutes
- D. 1 hour 50 minutes



$$T = \frac{D}{S}$$

$$= \frac{75}{50} \quad (75/50)$$

= 1.5 Then press the degrees minutes button

= 1 hour 30 minutes **HENCE C.**

- 8 Joan invests \$200. She earns interest at 3% per annum, compounded monthly.

What is the future value of Joan's investment after 1.5 years?

- A. \$209.07
- B. \$209.19
- C. \$279.51
- D. \$311.93

Compound interest formula

$$FY = PV (1 + r)^n$$

$$= \$200 \left(1 + \frac{3\%}{12}\right)^{1.5 \times 12 (= 18)}$$

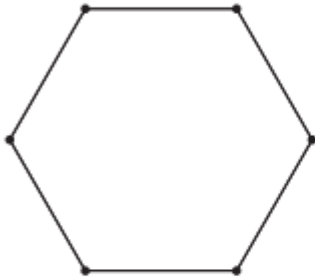
$$= \$209.19 \quad \text{HENCE B.}$$

9 Team *A* and Team *B* have entered a chess competition.

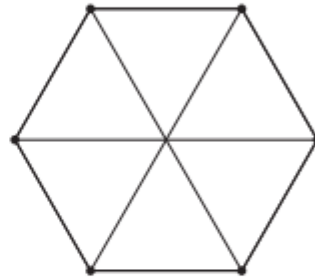
Team *A* and Team *B* have three members each. Each member of Team *A* must play each member of Team *B* once.

Which of the following network diagrams could represent the chess games to be played?

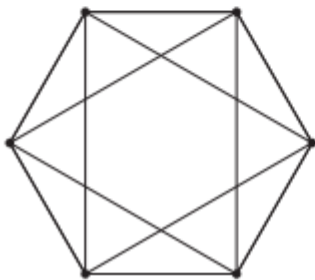
A.



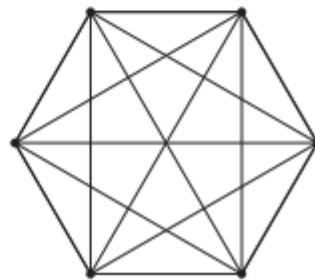
B.



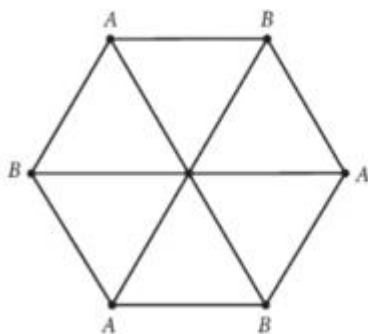
C.



D.



B Each person on Team *A* needs to play each person in Team *B* and vice-versa. That means each vertex must connect to 3 other vertices as shown in the diagram.



- An unusual question testing understanding of network concept and diagram

- 10 A plumber charges a call-out fee of \$90 as well as \$2 per minute while working.

Suppose the plumber works for t hours.

Which equation expresses the amount the plumber charges (\$ C) as a function of time (t hours)?

- A. $C = 2 + 90t$
- B. $C = 90 + 2t$
- C. $C = 120 + 90t$
- D. $C = 90 + 120t$

D $C = mt + c$

$c = 90$ (callout fee)

\$2 per minute = $60 \times \$2$ per hour (working rate)
= \$120 per hour

So $m = 120$

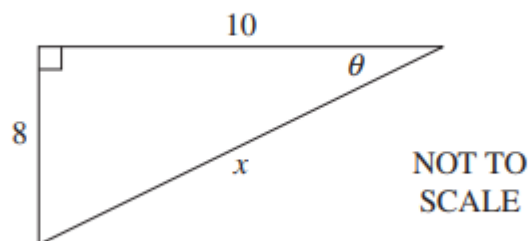
So $C = 120t + 90$, or

$C = 90 + 120t$

- Tests deeper understanding of algebra
- Converting a worded problem into a generalised formula or equation
- There's a lot of algebra in this exam, even in the statistics questions
- MANSW has reported to NESA that 'function of time' is not Maths Standard terminology

Question 11 (4 marks)

Consider the triangle shown.



- (a) Find the value of θ , correct to the nearest degree.

2

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- (b) Find the value of x , correct to one decimal place.

2

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(a) $\tan \theta = \frac{8}{10}$

$\theta = 38.6598$

$= 39^\circ$ (nearest degree)

(b) By Pythagoras $x^2 = 8^2 + 10^2$

$= 64 + 100$

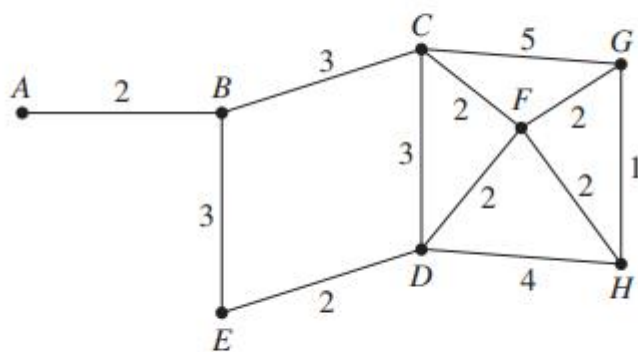
$= 164$

$x = \sqrt{164}$

$= 12.8$ (1 dec. pl.)

Question 21 (4 marks)

The diagram represents a network with weighted edges.



- (a) Draw a minimum spanning tree for this network in the space below and determine its length.

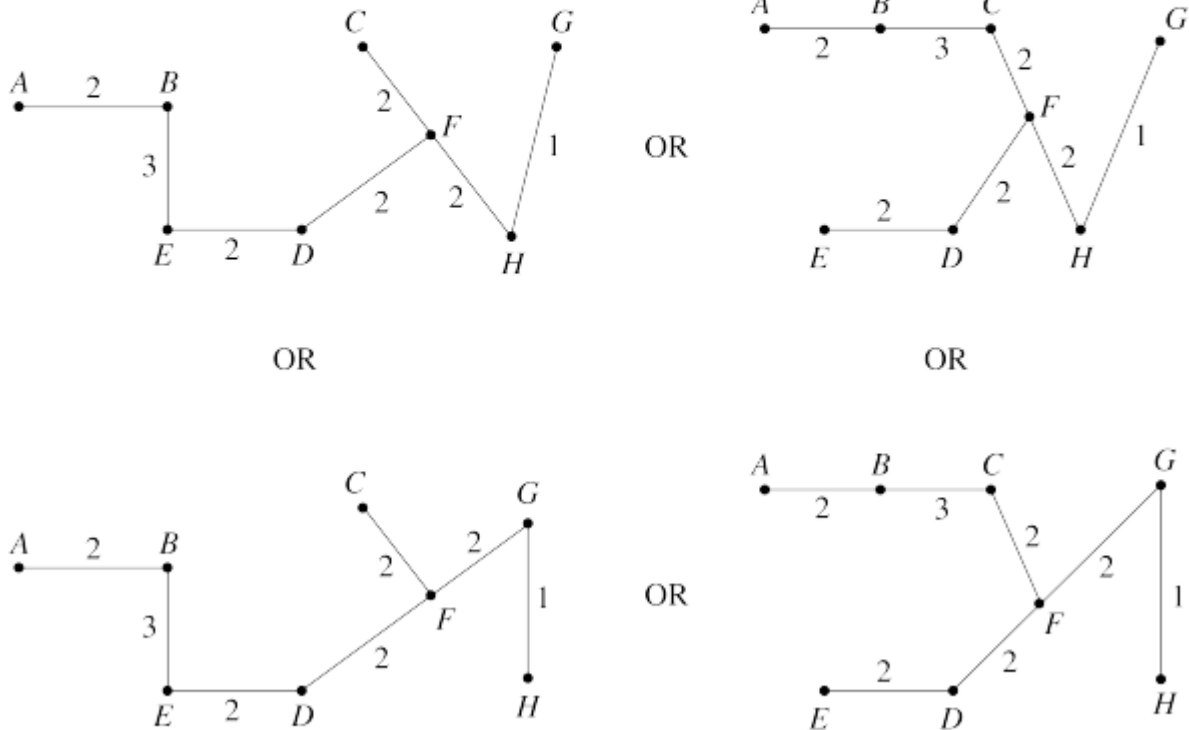
3

Minimum length of spanning tree =

Question 21 (a)

Criteria	Marks
• Draws a minimum spanning tree and states minimum length	3
• Draws a spanning tree (which is not minimum) and calculates its length	2
• Provides correct length based on the diagram drawn	1

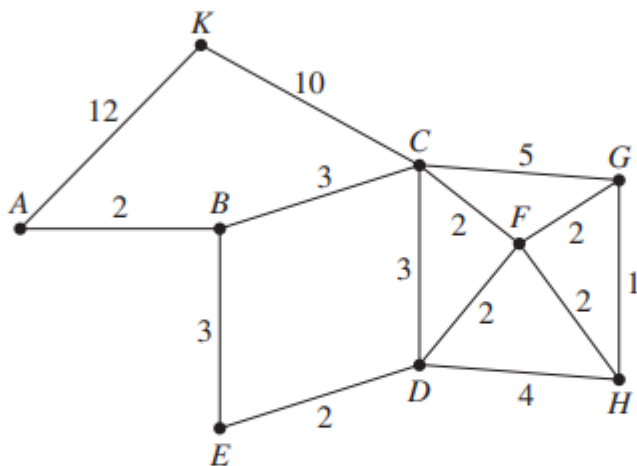
Sample answer:



The length of the minimum spanning tree is 14.

Question 21 (continued)

- (b) The network is revised by adding another vertex, K . Edges AK and CK have weights of 12 and 10 respectively, as shown. 1



What is the length of the minimum spanning tree for this revised network?

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Question 21 (b)

Criteria	Marks
• Adds 10 to the length found in part (a)	1

Sample answer:

$14 + 10 = 24$

Question 27 (3 marks)

The table shows the income tax rates for the 2019–2020 financial year.

3

<i>Taxable income</i>	<i>Tax on this income</i>
0 – \$18 200	Nil
\$18 201 – \$37 000	19c for each \$1 over \$18 200
\$37 001 – \$90 000	\$3572 plus 32.5c for each \$1 over \$37 000
\$90 001 – \$180 000	\$20 797 plus 37c for each \$1 over \$90 000
\$180 001 and over	\$54 097 plus 45c for each \$1 over \$180 000

For the 2019–2020 financial year, Wally had a taxable income of \$122 680. During the year, he paid \$3000 per month in Pay As You Go (PAYG) tax.

Calculate Wally's tax refund, ignoring the Medicare levy.

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Question 27

Criteria	Marks
• Provides correct solution	3
• Provides correct calculation of tax, or equivalent merit	2
• Makes some progress towards calculating the tax payable, or equivalent merit	1

Sample answer:

$$\begin{aligned}\text{Tax} &= 20\,797 + 0.37(122\,680 - 90\,000) \\ &= \$32\,888.60\end{aligned}$$

$$\begin{aligned}\text{PAYG tax} &= 3000 \times 12 \\ &= \$36\,000\end{aligned}$$

$$\begin{aligned}\text{Refund} &= 36\,000 - 32\,888.60 \\ &= \$3111.40\end{aligned}$$

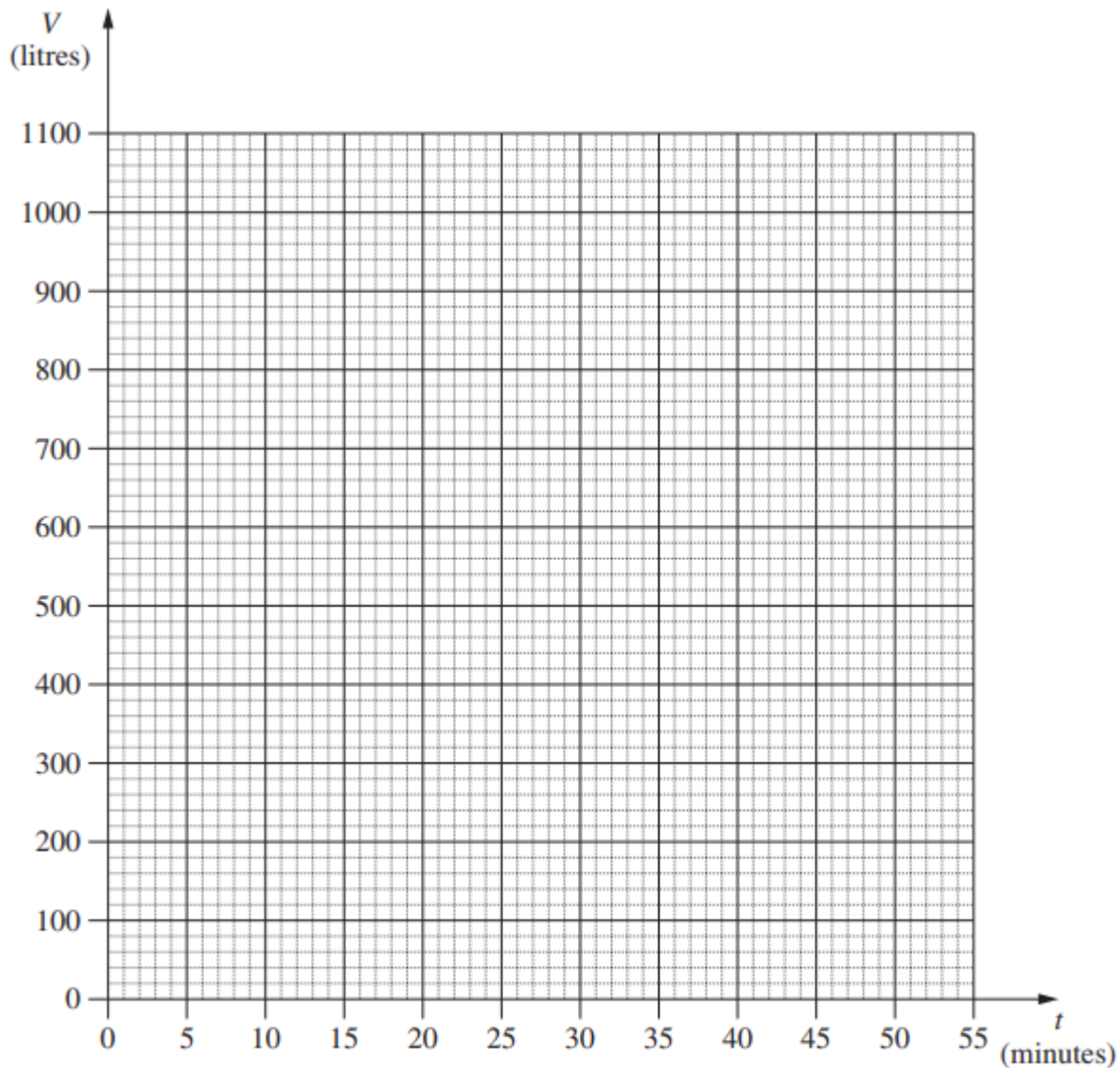
Question 29 (4 marks)

There are two tanks on a property, Tank A and Tank B. Initially, Tank A holds 1000 litres of water and Tank B is empty.

- (a) Tank A begins to lose water at a constant rate of 20 litres per minute. The volume of water in Tank A is modelled by $V = 1000 - 20t$ where V is the volume in litres and t is the time in minutes from when the tank begins to lose water.

1

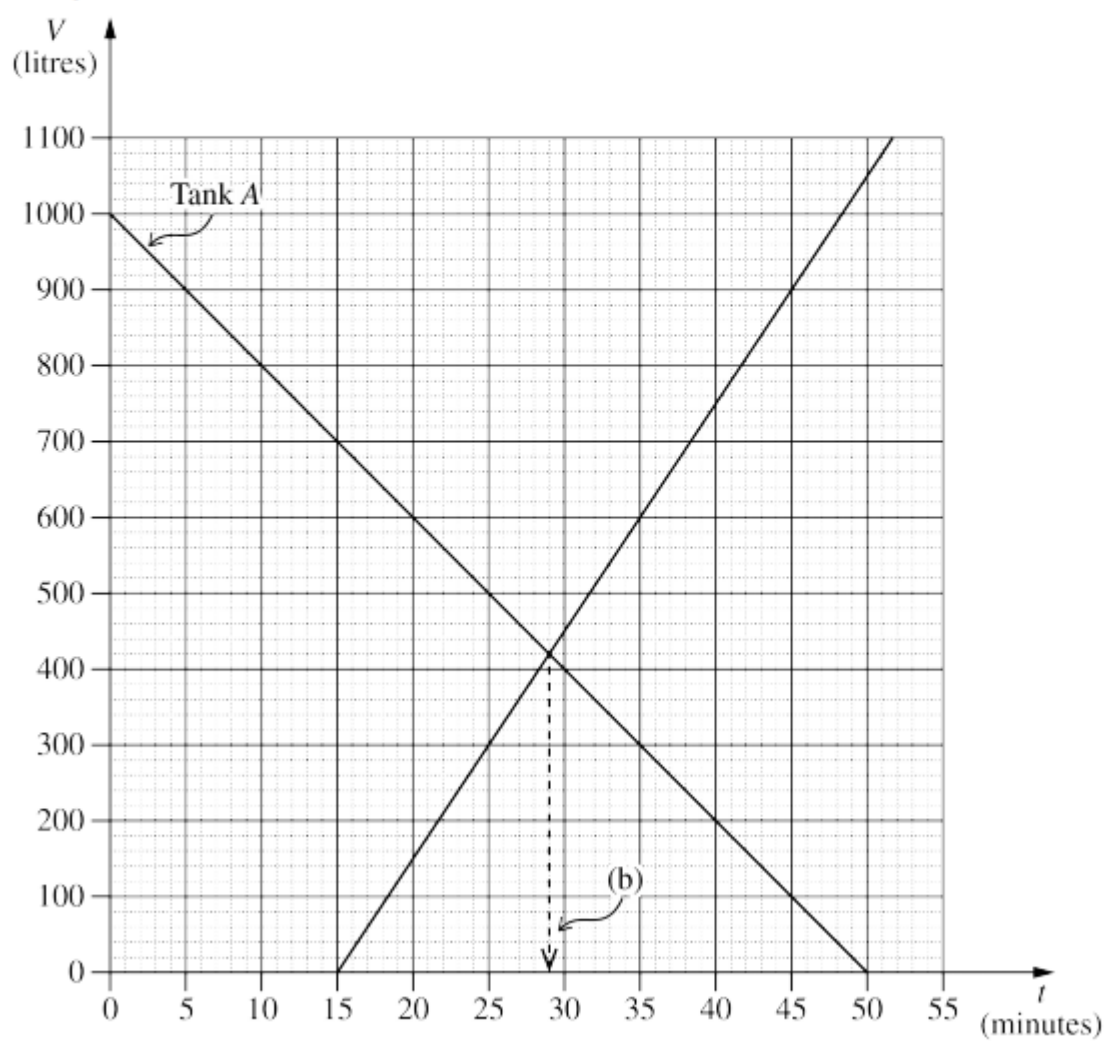
On the grid below, draw the graph of this model and label it as Tank A.



Question 29 (a)

Criteria	Marks
• Provides the correct solution	1

Sample answer:



Question 29 (continued)

- (b) Tank B remains empty until $t = 15$ when water is added to it at a constant rate of 30 litres per minute. 2

By drawing a line on the grid on the previous page, or otherwise, find the value of t when the two tanks contain the same volume of water.

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- (c) Using the graphs drawn, or otherwise, find the value of t (where $t > 0$) when the total volume of water in the two tanks is 1000 litres. 1

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Question 29 (b)

Criteria	Marks
• Provides the correct solution	2
• Draws the graph of volume for tank B , or equivalent merit	1

Sample answer:

29 minutes

Question 29 (c)

Criteria	Marks
• Provides the correct answer	1

Sample answer:

45 minutes