CAPRA COACHING

HSC Standard Mathematics Exam Booklet:
Algebra

Algebra **Name: ……**

1. What is the value of $3x^0 + 1$?

A. 1
B. 2
C. 3
D. 4

2. Which expression is equivalent to $\frac{k^2}{10} \div \frac{5}{k}$?

A. $\frac{2}{k}$
B. $\frac{k}{2}$
C. $\frac{50}{k^3}$
D. $\frac{k^3}{50}$

3. Which of the following expresses v as the subject of $k = \frac{1}{2}mv^2$?

A. $v = \pm\sqrt{\frac{2k}{m}}$
B. $v = \pm\frac{\sqrt{k}}{2m}$
C. $v = \pm\sqrt{\frac{k}{2m}}$
D. $v = \pm\frac{2\sqrt{k}}{m}$

4. A car is travelling at 950 km/h. How far will it travel in 2 hours and 30 minutes?

A. 38 km
B. 41.3 km
C. 218.5 km
D. 237.5 km

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5. It is given that $I = \frac{3}{2}MR^2$. What is the value of I when $M = 26.55$ and $R = 3.07$, correct to two decimals.

A. 375.35
B. 3246.08
C. 9965.45
D. 14948.18

6. What is the value of x in the equation $\frac{5-x}{3} = 6$?

A. -13
B. -3
C. 3
D. 13

7. Which expression is equivalent to $2(3x - 4) + 2$?

A. $6x - 2$
B. $6x - 4$
C. $6x - 6$
D. $6x - 10$

8. Caroline drinks two small bottles of wine over a three-hour period. Each of these bottles contains 2.3 standard drinks. Caroline weight 53 kg. What is her approximate blood alcohol content (BAC) at the end of this period?

A. 0.081
B. 0.065
C. 0.0017
D. 0.0014

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9. The concentration of a drug in a certain medication in 100mg / 5 mL. A patient is prescribed 2000 mg of the drug. How much medication should be given to the patient?

A. 4 mL
B. 25 mL
C. 100 mL
D. 400 mL

10. Which of the following correctly expresses Q as the subject of $e = iR + \frac{Q}{C}$?

A. $Q = Ce + CiR$
B. $Q = Ce - CiR$
C. $Q = \frac{e+iR}{C}$
D. $Q = \frac{e-iR}{C}$

11. Which of the following represents the correct solution to this pair of simultaneous equation?

$$2x + y = 8$$
$$x - y = 1$$

A. $x = 4$ and $y = 3$
B. $x = 2$ and $y = 4$
C. $x = 3$ and $y = 2$
D. $x = 2$ and $y = 3$

12. What is $\frac{6x^2y}{3} \div \frac{2y}{5}$ expressed in its simplest form?

A. $5x^2$
B. $30x^2y$
C. $\frac{1}{5x^2}$
D. $\frac{5}{4x^2y^2}$

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13. A hospital patient is given 1.2 litres of fluid over 10 hours by intravenous drip. The fluid is delivered at a rate of 20 drops per mL. What is the required rate, in drops per minute?

A. 0.1
B. 2.4
C. 10
D. 40

14. Expand and simplify $6x^2(x^2 - 1) - 2x^2$.

A. $6x^4 - 2x^2 - 1$
B. $6x^4 - 4x^2$
C. $6x^4 - 8x^2$
D. $-12x^6 + 12x^4$

15. A 2400-watt heater is run for six hours each day. If electricity is charged at $26.3c\ /\ kWh$, what is the cost of running the heater for eight days?

A. $3.03
B. $30.30
C. $302.98
D. $3029.76

16. Alicia just received her water bill for July. It shows the following charges. Use the table below to calculate the total amount due.

Water service	$45.15
Wastewater (sewerage)	$151.08
Water usage $24.2kL$ @ $\$2.248\ per\ kL$	
Amount due	

A. $198.48
B. $212.50
C. $244.48
D. $250.63

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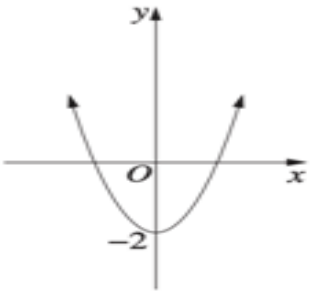
17. Which graph best represent the equation $y = x^2 - 2$?

A.



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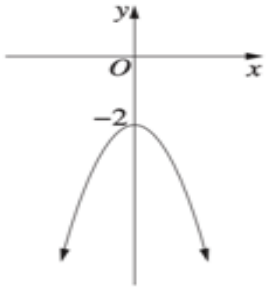

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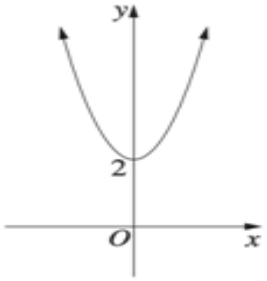

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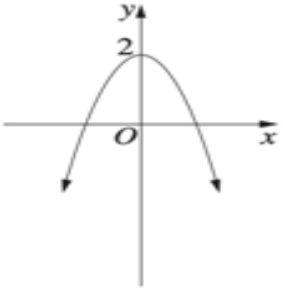

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18. A car travels $480km$ on 60 L of petrol. Its fuel consumption is:

A. $0.125\text{L}/100km$
B. $8L/100km$
C. $12.5L/100km$
D. $28.8L/100km$

19. The driving distance from Alex's home to his work is 20 km. He drives to and from work five times each week. His car uses fuel at the rate of $8\text{L}/100km$. How much fuel does he use driving to and from work each week?

A. 16 L
B. 20 L
C. 25 L
D. 40 L

20. Clark's formula, given below, is used to determine the dosage of medicine for children.

$$Dosage = \frac{weight\ in\ kg\ \times adult\ dosage}{70}$$

For a particular medicine, the adult dosage is 325 mg and the correct dosage for a specific child is 90 mg.

How much does the child weigh, to the nearest kg?

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21. Find the values of x and y which satisfy the following equations simultaneously.

$$y = x + 5$$
$$3y - x = 7$$

22. Solve the equation $\frac{2x}{5} + 1 = \frac{3x+1}{2}$, leaving you answer as a fraction.

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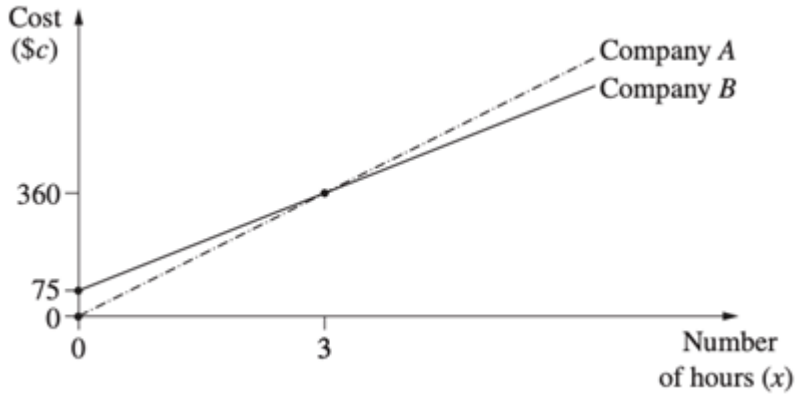
23. Every day, a 1200-watt microwave oven is used for 45 minutes at 40% power. Electricity is charged at \$0.25 per kWh. What is the cost of running this microwave oven for 180 days?

24. The graph displays the cost \$$c$ charged by two companies for the hire of a minibus for x hours.



Both companies charge \$360 for the hire of a minibus for 3 hours.

(i) What is the hourly rate charged by Company A?

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(ii) Company B charges an initial booking fee of \$75.
Write a formula, in the form of $c = mx + b$, for the cost of hiring a minibus from Company B for x hours.

(iii) A minibus is hired for 5 hours from Company B.
Calculate how much cheaper this is than hiring from Company A.

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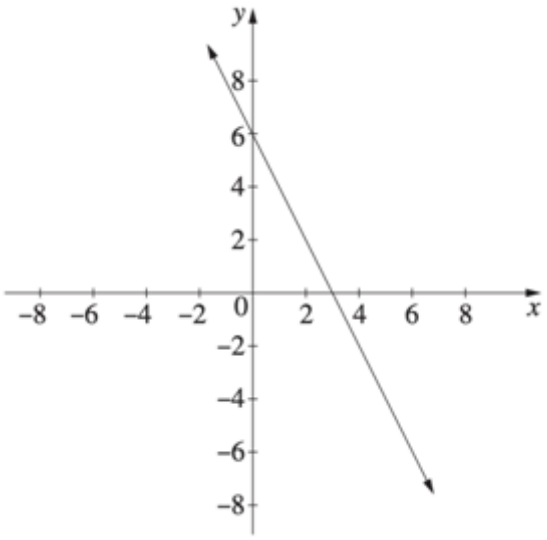
25. The graph of the line with equation $y = 6 - 2x$ is shown.



When the graph of the line with equation $y = x + 3$ is also drawn on this number plane, what will be the point of intersection of the two lines?

A. (0,6)
B. (1,4)
C. (2,2)
D. (3,0)

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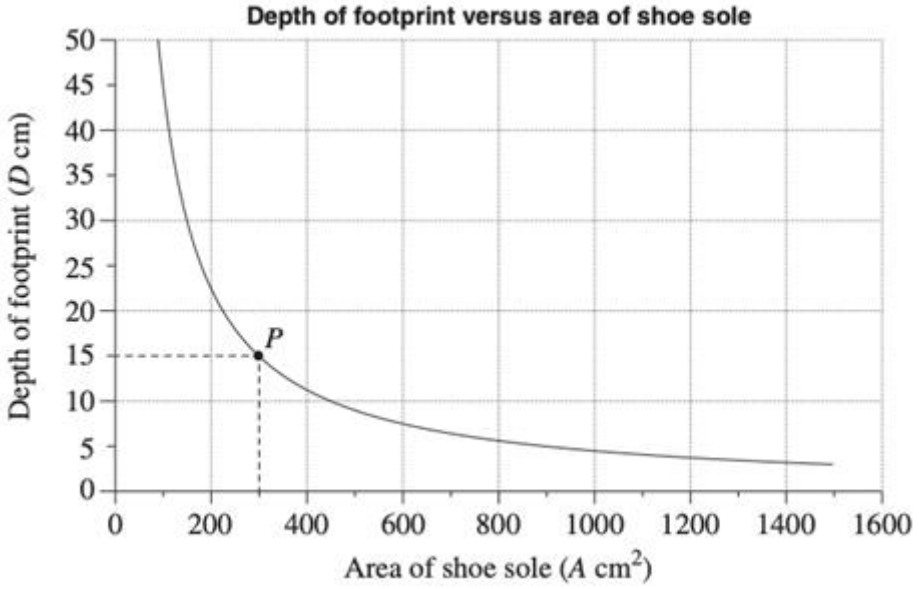
26. When people walk in snow, the depth (D cm) of each footprint depends on both the area ($A\ cm^2$) of the shoe sole and weight of the person.
The graph shows the relationship between the area of the shoe sole and the depth of the footprint in snow, for a group of the same weight.



(i) The graph is a hyperbola because D is inversely proportional to A. The point P lies on the hyperbola.
Find the equation relating D and A.

(ii) A man from this group walks in snow and the depth of his footprint is 4 cm.
Use your equation from part (i) to calculate the area of his shoe sole.

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27. Temperature Can be measured in degrees Celsius (C) or degrees Fahrenheit (F). The two temperature scales are related by the equation $F = \frac{9C}{5} + 32$.

(i) Calculate the temperature in degrees Fahrenheit when it is -20 degrees Celsius.

(ii) Solve the following equations simultaneously, using either the substitution method or the elimination method.

$$F = \frac{9C}{C} + 32$$
$$F = C$$

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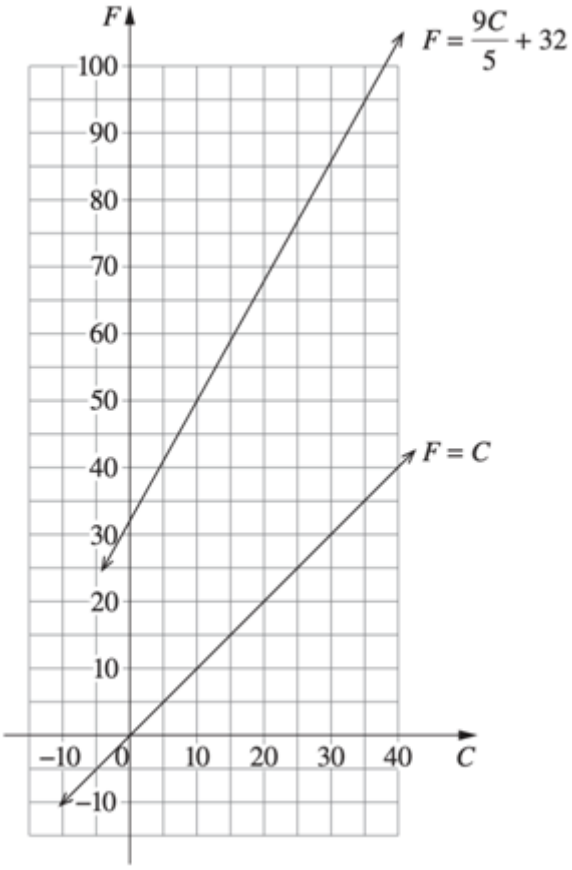
(iii) The graph of $F = \frac{9C}{C} + 32$ and $F = C$ are shown bwlow.



What does the result from part (ii) mean in the context of the graph?

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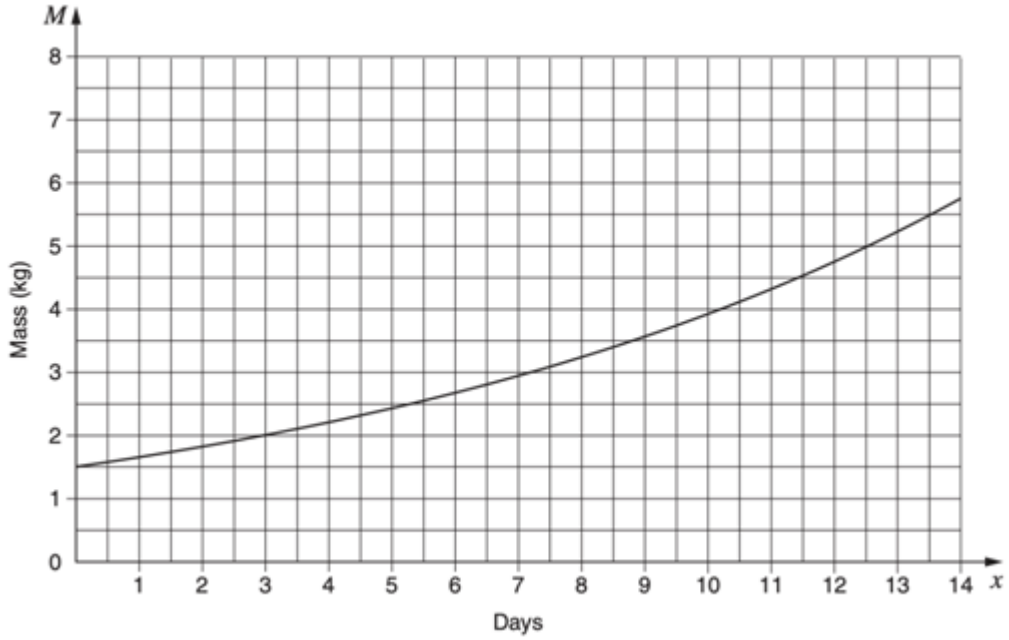
28. The mass M kg of a baby pig at age x days is given $M = A(1.1)^x$ where A is a constant. The gragh of this equation is shown.



(i) What is the value of A?

(ii) What is the daily growth rate of the pig's mass? Write your answer as a percentage.

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29. Solve these equation simultaneously to find the value of x and y.

$$x - y = 7$$
$$3x + 4y = 14$$

30. Make x the subject of the formula $y = k - mx$.

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31. The formula $D = \frac{2A}{15}$ is used to calculate the dosage of a medicine to be given to a child where D is the dosage in millilitres and A is the age of the child in months. Give your answer correct to the nearest millilitres.

(i) If Sam is 8 months old, what dosage of the medicine should he be given?

(ii) The correct dosage of the medicine for Luke is 5mL. What is Luke's age in months?

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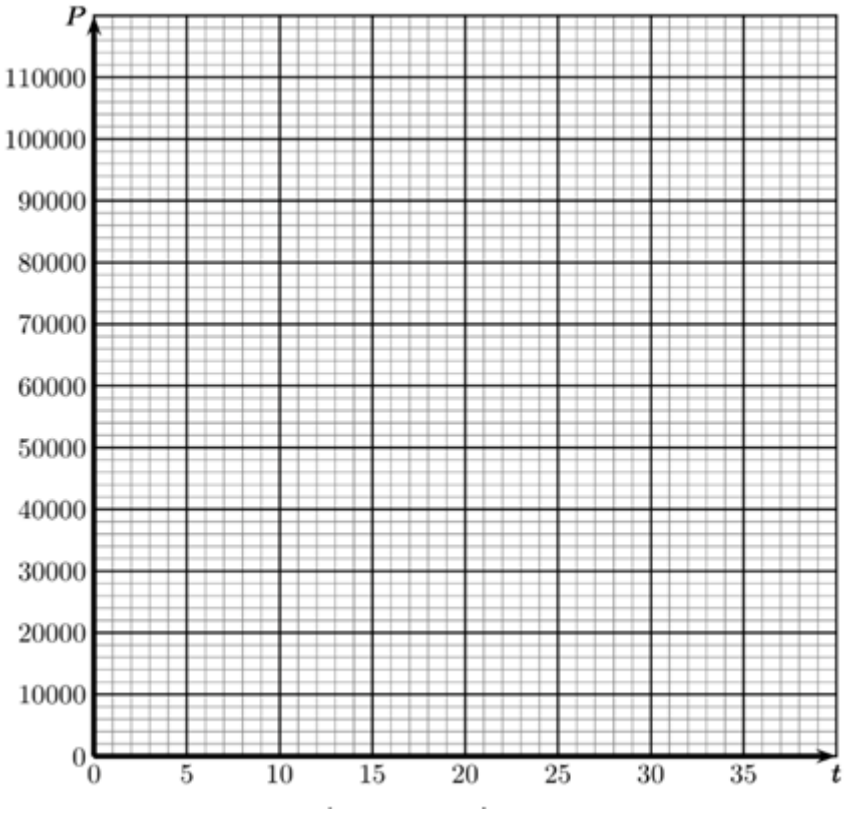
32. (a) The population of an island is increasing exponentially. The population of island is modelled using formula $P = 40000(1.03)^t$, where P is the population and t is the time in years.

(i) What was the initial population of the island?

(ii) Complete the table of values below using $P = 40000(1.03)^t$.

t	0	5	10	15	20	25
P						

(iii) Draw the population graph with t on the horizontal axis and P on the vertical axis.



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(iv) Use the graph to estimate the population at 18 years.

(v) Estimate the time taken for the population to reach 59000.

(vi) Extrapolate your graph to obtain an estimate of the time taken for the population to reach100000.

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(b) The distance, d km, travelled by a train is directly proportional to the time t, in hours, it has travelled and is given by the relationship $d = mt + b$. In five hours the train travelled 400 km. What is the value of b?