JP Maths Revision

Attempt the paper before watching the solutions!

https://www.youtube.com/@JPMathsRevision

HIGHER TIER

Quadratic Inequalities

INSTRUCTIONS

- Use **black ink** or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

INFORMATION

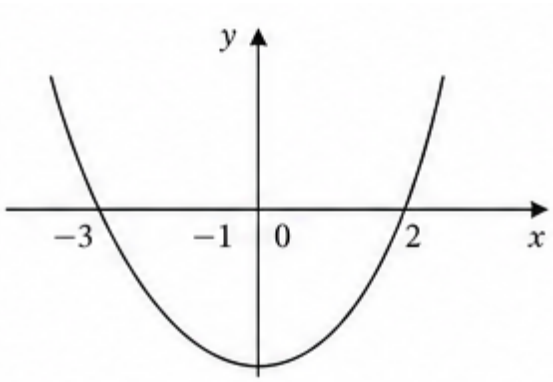
- The marks for **each** question are shown in brackets– *use this as a guide as to how much time to spend on each question.*

ADVICE

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

You've got this!

1. Use the graph of $y = f(x)$ to solve each inequality:



(a) $f(x) > 0$

$x > 2, \quad x < -3$

(1)

(b) $f(x) \leq 0$

$-3 \leq x \leq 2$

(1)

(Total for Question 1 is 2 marks)

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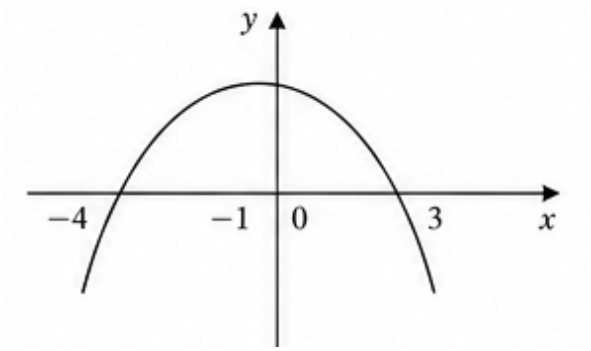
2. Use the graph of $y = f(x)$ to solve each inequality:



(c) Solve $f(x) > 0$

$-4 < x < 3$

(1)

(d) Solve $f(x) \leq 0$

$x \leq -4, \quad x \geq 3$

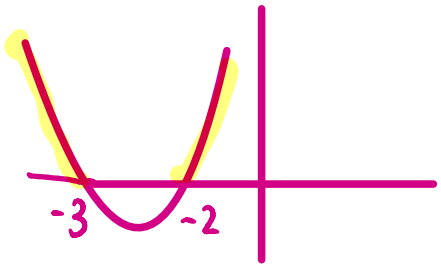
(1)

(Total for Question 2 is 2 marks)

3. Solve $x^2 + 5x + 6 > 0$

$(x+3)(x+2) > 0$

$x = -3, -2$



$x < -3, \quad x > -2$

(Total for Question 3 is 3 marks)

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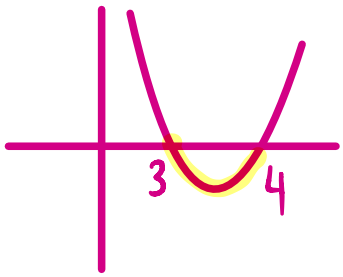
4. Solve $x^2 - 7x + 12 < 0$

$(x-4)(x-3) < 0$

$x = 3, 4$



$3 < x < 4$

(Total for Question 4 is 3 marks)

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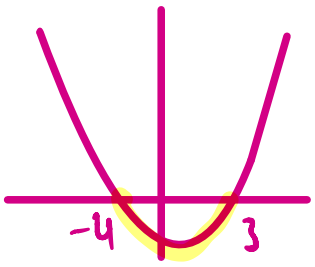
5. Solve $x^2 + x - 12 \leq 0$

$(x+4)(x-3) \leq 0$

$x = -4, 3$



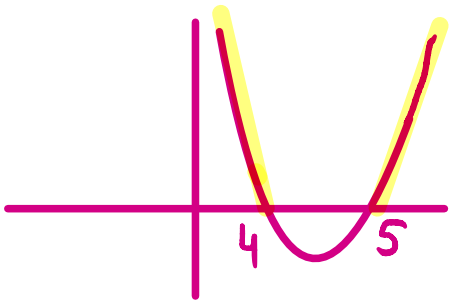
$-4 \leq x \leq 3$

(Total for Question 5 is 3 marks)

6. Solve $x^2 - 9x + 20 \geq 0$

$(x-5)(x-4) \geq 0$

$x = 4, 5$



$x \leq 4, x \geq 5$

(Total for Question 6 is 3 marks)

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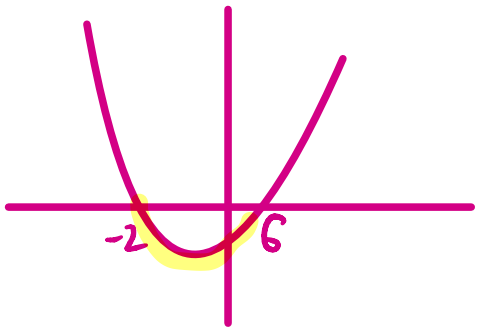
7. Solve $x^2 - 4x - 12 < 0$

$(x-6)(x+2) < 0$

$x = -2, 6$



$-2 < x < 6$

(Total for Question 7 is 3 marks)

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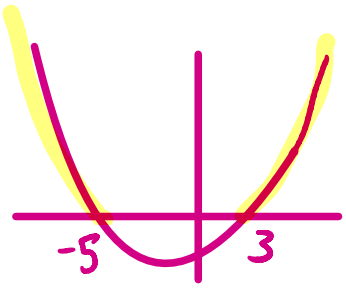
8. Solve $x^2 + 2x - 15 > 0$

$(x+5)(x-3) > 0$

$x = -5, 3$



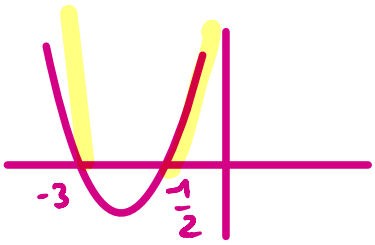
$x < -5, x > 3$

(Total for Question 8 is 3 marks)

9. Solve $2x^2 + 7x + 3 > 0$

$(2x+1)(x+3) > 0$

$x = -\frac{1}{2}, -3$



$x < -3, \; x > -\frac{1}{2}$

(Total for Question 9 is 3 marks)

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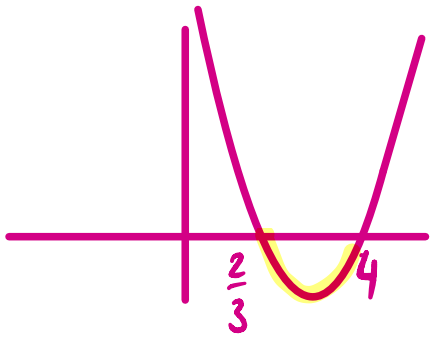
10. Solve $3x^2 - 14x + 8 < 0$

$(3x-2)(x-4) < 0$

$x = 4, \frac{2}{3}$



$\frac{2}{3} < x < 4$

(Total for Question 10 is 3 marks)

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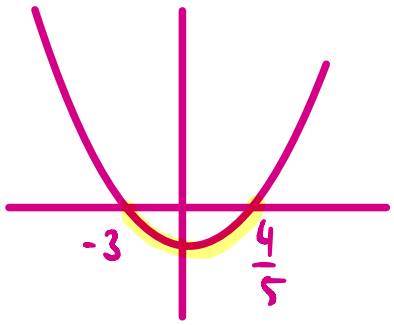
11. Solve $5x^2 + 11x - 12 \leq 0$

$(5x-4)(x+3) \leq 0$

$x = \frac{4}{5}, -3$



$-3 \leq x \leq \frac{4}{5}$

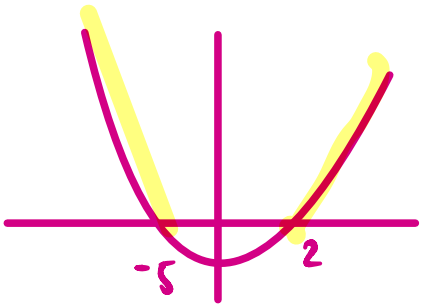
(Total for Question 11 is 3 marks)

12. Solve $x^2 + 3x > 10$

$x^2+3x-10>0$

$(x+5)(x-2)>0$

$x=2,\ -5$



$x<-5,\ x>2$

(Total for Question 12 is 3 marks)

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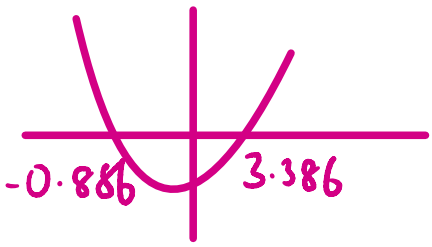
13. Solve $2x^2 - 5x + 1 < 7$

$2x^2-5x-6<0$

$x=\dfrac{5\pm\sqrt{25+48}}{4}=\dfrac{5\pm\sqrt{73}}{4}=3.386,\ -0.886$



$-0.886<x<3.386$

(Total for Question 13 is 3 marks)

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14. Solve $3x^2 + 4 > 10x$

$3x^2-10x+4>0$

$x=\dfrac{10\pm\sqrt{100-4(3)(4)}}{6}=\dfrac{10\pm\sqrt{52}}{6}=2.8685,\ 0.4648$

$x<0.465,\ x>2.87$

(Total for Question 14 is 3 marks)

15. Solve $x^2 + 4x - 7 > 0$

$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(-7)}}{2}$

$= \frac{-4 \pm \sqrt{44}}{2} = 1.317, -5.32$

$x < -5.32, x > 1.32$

(Total for Question 15 is 3 marks)

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16. Solve $2x^2 + 3x - 4 < 0$

$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-4)}}{2(2)} = \frac{-3 \pm \sqrt{41}}{4} = 0.851, -2.35$

$-2.35 < x < 0.851$

(Total for Question 16 is 3 marks)

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17. Solve $3x^2 - 2x - 5 \leq 0$

$x = \frac{2 \pm \sqrt{4 - 4(3)(-5)}}{2(3)} = \frac{2 \pm \sqrt{64}}{6} = \frac{2 \pm 8}{6} = \frac{5}{3}, -1$

$-1 \leq x \leq 5/3$

(Total for Question 17 is 3 marks)

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18. A rectangle has width x cm and length x+5 cm.

Its area is less than 84 cm^2.

Form and solve an inequality for x.

$x(x+5)<84$

$x^2+5x<84$

$x^2+5x-84<0$

$(x+12)(x-7)<0$

$x=-12, 7$

$-12<x<7$

$x>0$

Since length

So $0<x<7$

$0<x<7$

(Total for Question 18 is 4 marks)

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19. A ball is thrown upwards.

Its height is modelled by: $h = -5t^2 + 20t + 3$

Work out when the ball is above 15 m.

$-5t^2+20t+3>15$

$-5t^2+20t-12>0$

$5t^2-20t+12<0$

$t=\dfrac{20\pm\sqrt{20^2-4(5)(12)}}{2(5)}$

$=\dfrac{20\pm\sqrt{160}}{10}$ → $t=3.265$, $t=0.735$

$0.735<t<3.27$

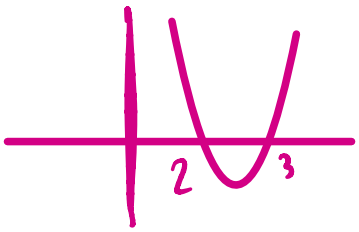
(Total for Question 19 is 4 marks)

20. Find the set of possible values of x for which

$x^2 - 5x + 6 > 0$ **and** $x < 5$

$(x-3)(x-2) > 0$

$x = 3, 2$



$x < 2$

$x > 3$

Since $x < 5$

$x < 2$ or $3 < x < 5$

$x < 2$ or $3 < x < 5$

(Total for Question 20 is 4 marks)

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21. Find the set of possible values of x for which

$x^2 + x - 12 \leq 0$ **and** $x > 0$

$(x+4)(x-3) \leq 0$

$x = 3, -4$

$-4 \leq x \leq 3$

$x > 0$

so $0 \leq x \leq 3$

$0 \leq x \leq 3$

(Total for Question 21 is 4 marks)